A New Alpha-Omega Map for Acquisition Test and Evaluation

George Axiotis

Department of Defense, Washington, D.C.

Department of Defense (DoD) Acquisition Test and Evaluation (T&E) has been the gatekeeper to Major Defense Acquisition Program production since its formalization over 25 years ago. Yet, the landscape of the types, methods, and sources for war fighting systems has significantly evolved. The Department has studied and recommended action for Acquisition reform for decades, only tweaking in the margins for T&E. The time is right for DoD to consider a new approach to T&E, steering away from the "buy" decision to the more relevant "acceptance" and "operational" domains. This article outlines the issues and proposes a new "Alpha-Omega" map for T&E for the way we actually procure DoD systems.

Key words: Acceptance tests; acquisition reform; contractual necessity; field operations; low-rate initial production; near-peer threat; persistent engagement; users.

epartment of Defense (DoD) leaders and numerous reform studies criticize the acquisition process for its inability to control spiraling costs and delays in getting systems to the user. In response, acquisition reform efforts to date focus on better requirements, efficient resources planning, as well as increasing feedback and accountability.[1] DoD Test and Evaluation (T&E), comprising the formal processes, policies, personnel, equipment, facilities, and consumables necessary to develop, certify, test and evaluate defense systems for production, has faced much of this criticism. In response, T&E reform focuses on process streamlining, reducing overhead, and further integration within the engineering process to better support the "buy" decision. The defense acquisition process, using T&E as a gatekeeper, is relatively unchanged since the Packard Commission recommendations.[2] Yet, the methods and players of DoD acquisition have fundamentally changed. Just as the Pentagon is embracing a new map for the application of military power based on an active strategy for the world, as it is today, DoD needs a similar active strategy for who is best served by T&E.[3]

This article examines the fundamental influences to Acquisition T&E and the results of major studies to date on reforming Acquisition T&E, and concludes that the current emphasis on "buying" as the "raison d'être" for T&E must be replaced with a new two-tiered framework and leadership that better support both contractual necessity and operations in the field. There is a new world of defense systems acquisition driving the need for a new map for T&E based on acceptance and operation, which I suggest are the *Alpha* and *Omega* of a new T&E order.

Good intentions

Acquisition T&E follows a linear engineering approach to reduce risk, build insight to meet contract delivery, and assess the delivered configuration in operational environments, verifying that the system works warranting further procurement.[4] Acquisition T&E is Service- and system-centric, managed through dedicated funding and contract vehicles with both developmental (DT) and operational testing (OT) supporting the "buy" decision. Public Law delays the decision until a "Beyond LRIP Report" is published following OT.[5]

Yet for all its formality, T&E plays a weak role in controlling what the Department actually buys. The current DoD Acquisition policy allows initiation of low-rate initial production (LRIP) just after Critical Design Review. What test results are available support this decision, but completion of testing or successful results are not formal prerequisites.

There is no DoD "*Approval for Service Use (ASU)*" decision based on successful test results. The only legal

Report Documentation Page

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE **DEC 2009**	2. REPORT TYPE	3. DATES COVERED **00-00-2009 to 00-00-2009**

4. TITLE AND SUBTITLE **A New Alpha-Omega Map for Acquisition Test and Evaluation**	5a. CONTRACT NUMBER
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Department of Defense,Washington,DC,20301**	8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**8**	

hurdle to proceeding beyond LRIP is a report by the Director of Operational Test and Evaluation (DOT&E) of an operational test where the test plan was approved in advance by DOT&E.[6] Again, as with LRIP, there is no requirement to pass the test, only to conduct it. Acquisition T&E today operates within a "buy" construct that neither demands minimal user-oriented testing before beginning the production process nor formalizes the full commitment to production through successful completion of testing.

Emphasis on speed

DoD Acquisition reform since the mid-1990s emphasizes faster cycle times through efficient management, capitalizing on emergent technologies, fielding of early capabilities, and continuous product evolutionary cycles. The objective is to maintain a competitive edge by getting to the "buy" decision faster. Yet, in World War II (WWII), compelling need put emphasis on production, with T&E supporting it. Production changes, additional requirements, and performance shortfalls based on experience in the field were the foundations for block upgrades.[7] Over 60 years later, the Mine Resistant Ambush Protected Vehicles procurement mimics this approach with an emphasis on T&E supporting production.[8]

DoD works to balance procurement for both a longer-term near-peer threat as well as near-continuous engagement against a less-defined extremist threat.[9] Senior leaders rely on the current acquisition construct in favor of one that responds better to ill-defined threats, requirements that grow and change rapidly, and technologies that evolve many times within the development cycle.[10] Today, as in WWII, the focus is getting the right capability to the field faster, but speed-to-user is not enough to drive significant change in T&E.

A new environment, really

There have been profound changes to DoD systems development and acquisition brought about by industry practice and by government policy that sets the new environment for T&E.[11] The following provides an illustrative snapshot:

- **Requirements process.** Requirements have steered away from the primacy of technocrats, planners, and buyers to the current end-user.[12] Component Commanders present unique challenges, as they focus on near-term needs and have different visions for how requirements are met and how advanced technology can be used. These users are less concerned with technology nuances, industrial influences, and specific capabilities.

Yet, to manage successful acquisition, specificity is critical for configuration design and engineering.

- **Systems development.** Systems are more complex, and the ability to characterize fully end-state performance before fielding is a challenge. Lead systems integrators have increasingly less insight into the subsystems they are integrating and thus less confidence in understanding, and certifying to, actual systems-of-systems performance. The burden increasingly falls back to the Department to resolve, with risks not only from increasingly complex systems-of-systems integration with differing maturity but also from the globalization of defense industrial capability.

- **Industrial base.** The consolidation of the defense industrial base through the 1990s has left DoD with fewer options for competitive development of major capital systems. This drives systems to take on inherent design, engineering, production, and management practices with less government insight. Key components and materials will increasingly be available only from foreign sources with subsequently less control of the design and engineering.[13] The emphasis shifts from preproduction to as-delivered product adequacy.

- **Mismatched acquisition strategies.** The recently signed DoD 5000.02 Instruction relies on technologies being wrung out before initiating development, competitive prototyping used to find the "best of breed," and due diligence through T&E before production. Yet, technology evolves too quickly to tie acquisitions to fixed baselines with initial units differing in performance and utility from those later on in production. Lead systems integrators today deliver systems comprising subsystems in various levels of maturity and product life cycles.

- **Non–Service-unique systems.** In spite of the rhetoric, DoD does not buy capability; it buys "things" (systems) that are married to others, and users, to form war-fighting capabilities. While DoD is procuring more "joint" systems than ever before, the vast majority are still Service-centric asked to operate in ever increasingly joint environments.[14] It has become more difficult to characterize one system's adequacy for its own acquisition decision without interdependent systems that in and of themselves are of varying maturity levels.

- **Networked operations.** National defense strategy reflects ever-increasing multi-Service and Coalition operations.[15] These self-forming oper-

ations preclude fully understanding interfacing systems performance or concepts of operations to support an adequate operational test in advance of fielding decisions. While the Department's *Testing in a Joint Environment Roadmap* of 2004 set a vector to lash together the disparate testing capabilities within the Department and Industry, it can only go so far given ever-changing configuration baselines and unpredictable alterations of netted combat systems.[16] Testing and subsequent evaluations will focus more on in-theater assessments.

- **Expanded acquisition authority.** Once the domain of major Service Commands, acquisition authority has spread to user and mission-centric organizations such as Missile Defense Agency and Special Operations Command, each with their own processes. As such, systems developers will have less confidence in their system's performance as they have less insight into, or control of, interfacing systems. T&E will less likely depend on a priori knowledge of full system capability and default to rudimentary baseline assessments.

- **T&E beyond the Program Manager (PM).** System complexity and interconnectivity means that testers will find it difficult to build a test scenario that characterizes all desired performance points within shorter development time frames. Added is less confidence in the threat or expected concepts of operations as each user will likely tailor operations to their own needs. Acquisition will increasingly rely on tests outside the PM's control to build just enough insight for the decision needed. Capitalizing on other data from which to build consensus is key to Integrated T&E methodologies of the revised DoD 5000.02.[17]

- **Services are oversight.** Service T&E has undergone massive consolidation since the mid-1990s, which is not likely to be reversed anytime soon. Since 2000, the U.S. Army has consolidated much of its T&E organization and reduced its workforce between half and two-thirds. The U.S. Navy reduced personnel and substantially integrated its prime contractor/government testing. The U.S. Air Force further shifted DT control to prime contractors with commensurate reductions in its workforce.[18] The burden of conducting traditional Service DT has fallen more onto the contractors as part of the product acceptance process.

The above "snapshot" shows not only what ways have changed when the Department acquires its systems, but also that most aspects cannot be addressed without fundamental change in T&E. Much of what exists in today's "new" methodologies to help nudge the acquisition process along in this new environment ignores the Acquisition T&E world as it has become. The current processes quickly succumb under the weight of the endless reviews and forums.

No real change

DoD conducted three comprehensive studies on weapon system acquisition, with emphasis on T&E, to include the Defense Acquisition Performance Assessment (also known as [aka] DAPA Report), the Defense Science Board Task Force on Developmental Test and Evaluation (aka DSB Report on T&E), and the Joint Defense Capabilities Study (aka Aldridge Study). These authoritative studies produced a myriad of recommendations for T&E and Acquisition. While each report had its emphasis, their findings and recommendations for T&E were generally similar and grouped into four broad thrusts:

- gain organizational efficiencies by blurring the distinction between DT and OT,
- push discovery earlier in the process through more rigorous testing up front,
- increase transparency and streamline process overhead, and
- better utilize the planning and acquisition processes for joint war fighting needs.

All three studies hoped to efficiently push T&E to better support the "buy" decisions through process streamlining and combining DT and OT events where possible as part of an integrated T&E framework feeding a continuous thread of discovery. These reports form the basis of the DoD 5000 Integrated T&E strategy. Yet, "integration" is fundamentally an efficiency exercise of questionable purpose as early-on schedule and cost avoidance are lost through later rework and retest.

Unfortunately, neither report reassessed T&E's role or its customer. While testing is fundamental to systems engineering and contractual compliance, Acquisition T&E is seen as a "speed bump" to procurement. In trying to serve many masters, T&E became costly, less efficient, and its reports of questionable utility to both buyers and users.

A future of many masters

Future Acquisition T&E must support two acquisition extremes, the quick-reaction, less-defined threat and the long-term, near-peer threat.[19] It must also support near-term contractual necessities as well as longer-term product life-cycle processes. The emphasis is on early capability delivery for initial fielding. For

many complex systems, the Department will only begin to understand what it has received once it is delivered and operating in the field. The Missile Defense Agency recognized this and developed T&E processes to support dedicated knowledge points that now form the basis for the revised DoD 5000.[20]

As in WWII, we find ourselves with users forward deployed and persistently engaged and needing 75 percent solutions in months. DoD must be more efficient and effective in getting information to the user and feedback from operations in the field.

A new model
Utility, not buying
Acquisition T&E must focus on its mission, not function, to support Acquisition and system complexity as they are today. T&E must uncover critical risks prior to initiating a program or, once begun, build knowledge to trade off risk. The focus today is to provide capability as soon as it is ready, with T&E the primary mechanism for fielding the right capability at the right time. This new model proposes it be separate from, but affiliated to, the buying decision.

While we acquire systems through the buying process, it is capabilities based on aggregates of constantly evolving systems that are delivered to the user. Authority to initiate development has become the initial production approval point reflecting the national commitment it is. The Acquisition process is no longer the tidy affair it once was. Yet, it is how DoD responds that is the basis for a new T&E model, which shifts emphasis from "buying" to the more relevant product acceptance and operational domains.

An "Alpha-Omega" model
The new model for T&E shifts the emphasis from buying to two basic, but not necessarily sequential, domains. The first includes activities to characterize sufficiently systems in support of contractual necessities, management, and initial fielding decisions—the world of acceptance tests or "Alpha Tests." The second includes the operational assessments made some time later to assess mission value added over the fielding life cycle or "Omega Tests."

The vision is a T&E process that accelerates the delivery of initial DoD capability by developers, while ensuring continuous evaluation of performance in the field for current operations and future capability development. This approach supports acquisition and life cycle activities such as the Department's Performance-Based Logistics and Training.

Alpha testing
Alpha Testing events are necessary to meet contractual requirements by capturing initial baseline capabil-

ity for Service use. "Alphas" comprise all initial experiments, contractor development tests, quality tests, Service-unique interface and environmental compliance tests, security and accreditation tests. They are the necessary blending of contractor tests (CT) used to support delivery to the government with the traditional Service-oriented interface testing (DT) performed later on. Alpha Testing is a continuous aggregate of events, not necessarily fully completed events or *pass-fail* by their structure. Alphas are "owned" by a much broader community of stakeholders and not necessarily under any one single agent's control. Their results form the basis for decision gates ultimately for service use. Alpha Tests provide the basis for understanding delivered items at the time of delivery, not necessarily against a priori baseline parameters.

An Alpha Test construct capitalizes on all existing data sets, whether or not contractor derived, and is not throttled by concerns over the color of money, contracts, or ownership. It feeds on other Service efforts, direct and indirect PM efforts, training and fielding activities. Alphas fill the bin of system knowledge regardless of source. Alphas provide the PM, and those of affiliated efforts, the freedom to select the appropriate data from which to argue the case for delivery, up to and including Approval for Service Use (ASU). Where there is lack of data, the PM is obligated to fill the void or ensure that others do their share to help build the case for ASU.

An Alpha approach requires involvement by customers, users, test and oversight agents for insight and advice where practical or necessary given their control over ASU. Less oversight is required during Alpha Testing as the burden falls on the PM to build the case to deliver the incremental capability to the next user or integrator in the chain. This methodology is consistent with that used by sub-tier vendors delivering subsystems to the lead systems integrators and consistent with the Department's Systems Engineering Guide.[21]

Omega testing
Omega Tests are those scripted and unscripted, supervised and unsupervised demonstrations of systems operation in the field. Users, operational test agents, oversight, training, logistics, and doctrine agents focus on system utility and are less concerned with the buying decision. Omega Testing capitalizes on data and experience in the field, not as pass-fail since the Department has long since committed to the program, but to build on the baseline understanding of capabilities and limitations at ASU. Omega feedback also forms the basis for the next capability increment or decision to move on to new capabilities. Data and

insight, through formal reports, assessments, or observations, are provided to the community at large to include operations research, requirements generators, product life-cycle managers, Program/Project Managers, oversight entities such as Service Chiefs and DOT&E, and training and doctrine agents.

A significant issue using today's OT&E construct is pegging deficiencies uncovered in complex systems-of-systems tests for a product-centered acquisition process. An Omega strategy broadens the responsibility as these events are funded through a myriad of single and combined sources to include Component Commanders, Training and Doctrine Commands, Research, Logistics and Engineering Activities, Intelligence Agencies, Programs, and other Service Acquisition agents.

This approach expands the community of Omega agents far beyond that limited by the Service Operational Test Activity (OTA) and removes the "black hat" image of today's operational testers. There would be less concern by Acquisition principals that OTA input blurs the role between system buying and fielding. Nevertheless, U.S.C. Title 10 must be revisited given the requirement to conduct an OT, and for DOT&E, an independent operational assessment must be made, prior to proceeding beyond LRIP. It is likely DoD will need consensus with Congress to either formalize a supervised period of Alpha testing on basic systems to support independent reporting or use the first Omega evaluation as the gatekeeper to further cross-Service capabilities. The latter would seem more appropriate as Congress and the DoD get a better picture of capabilities fielded and future needs with effectiveness judged through a broader evaluation lens.

Organizing to the Alpha and Omega

Service field activities would continue to function as life-cycle agents and as centrally or directly funded Alpha testers, supporting any Alpha event whether Service-specific or at Contractor sites. Alpha, being nonpartisan, can be managed either before formal program initiation, during program phases, or as part of postproduction life-cycle support. Much of this structure is already in place as test personnel at Department Major Range and Test Facility Base activities are direct customer-funded operations.

Service OTAs, freed from the grip of the acquisition process, support customers of all types. OTA and Omega would be funded through a much broader array of customers less tied to programs. The expeditionary OTA, or other agents tapped for such roles, deploy to theaters of operations or specific test sites to act as user test or evaluation agents. A much smaller senior cadre

would be reserved for overseeing Alpha events supporting ASU decisions through working arrangements with program offices. Their portfolio of products and services would be greater than current program-centric assessments. The OTAs would be managed by the Services, overseen by DOT&E, and free to expand their operations worldwide to include foreign systems. This new and expanded role sets the OTA on a path to supporting future war fighting capability.

The emphasis is on empowering, with responsibility based on a closer working relationship between the developers and users. The Alpha-Omega strategy relies on three simple rules by which to frame progress and argue for ASU when appropriate.

1. What war fighting capability is provided (i.e., not the "thing" being procured)?
2. To what degree does it work, and how do you know (i.e., capabilities/limitations as delivered)?
3. What are the impacts to other systems (i.e., risk assessment across the Doctrine, Organization, Training, Materiel, Leadership and education, Personnel, and Facilities domains)?

Empowered testers

Testers and evaluators increase their impact on new program vectors. The emphasis is not on whether systems are good enough to buy (as they are already being bought) but rather what new vector must be set based on performance and deficiencies observed. OTAs plan, manage, and oversee Omega Tests as well as assess capability in the field, working with the users to vet future capabilities, upgrades, or changes to doctrine and concepts of operations. A new Joint Omega Executive provides both independent and collaborative insight of systems-of-systems operations in the field to support capability increments.

The right oversight

The Under Secretary of Defense for Acquisition, Technology and Logistics—through either the Director for Systems Engineering or the new Director for Developmental T&E[22]—oversees Alpha activities, ensuring that adequate insight and progress supports (along with user input) the decision when capabilities are fielded. This leader would also ensure sufficient capacity, training, and capability exists at T&E facilities. The DOT&E would oversee all Omega testing, advise on operational realism for Alpha events, and continue to report independently to Congress. Oversight agents would focus less on technical detail and more on validating that the achieved capability is usable and understood by the users.

A new Test and Evaluation Master Plan (TEMP)

A cottage industry has been built around TEMP production to document the PM and OTA commitment for T&E. Yet, in the pace of today's programmatic change, the TEMP becomes rapidly outdated. Under this process, the TEMP merely outlines the PM's top-level strategy for the next ASU decision focusing on system maturity, external resources, and likely data collection points for ASU.

Conclusions

The recently revised DoD instruction on acquisition strengthens the primacy of fielding, through acquisition, with T&E primarily supporting the latter. This article proposes a new map for Acquisition T&E supporting today's persistent engagement as well as the next near-peer threat. The DoD cannot wait for optimal solutions before fielding capabilities or rely solely on T&E as its gatekeeper. This new Alpha-Omega strategy, based on acceptance testing for delivery and operational use evaluations in the field, is on par with Acquisition as it is today, not on how we wish it to be. This strategy recognizes and accepts T&E's core role in engineering and contract compliance, as well as T&E's ultimate customer—the user.

This article examines how the acquisition environment has changed and how the process itself has evolved as it continues to adapt to this new reality. Nevertheless, recent authoritative studies on T&E have not recognized these fundamental changes in the landscape and have only recommended modest changes to T&E processes to speed it up a bit and make it cost a little less. T&E must emerge from its relegated shadows in acquisition to support a new customer set. The Alpha-Omega strategy hopes to change this by shifting the traditional OTA role out of the "buy" process into the more relevant fielding process as the agent of choice for a much wider set of customers to include not only Service acquisition and life-cycle agents, but also Component Commanders, Trainers and Doctrine agents, and Requirements developers.

The Alpha-Omega strategy for T&E supports bringing capability to the field faster, with better understanding of capabilities and limitations, across a broader set of systems of systems than current methodologies, streamlined or not, can ever do. The time is right for fundamental change.   ❏

GEORGE AXIOTIS currently leads the Integrated Resources Analysis Team for the director, Operational Test and Evaluation (DOT&E) providing Congressionally man- dated assessments of T&E resources used for Defense Department testing as well as oversight of Service test resources investments. Mr. Axiotis, a recent graduate of the Industrial College of the Armed Forces, has over 26 years in defense acquisition and T&E having been program, project, and test manager on four Defense Acquisition programs, a program sponsor as well as T&E advisor to two program executive officers. Before coming to the Pentagon, George was director of the Naval Sea Systems Command Test and Evaluation Office. E-mail: george. axiotis@osd.mil

Endnotes

[1]Department of Defense, "Joint Defense Capability Study of 2004". aka, "Aldridge Study: Joint Defense Capabilities Final report" (2004): 2–7. https://acc.dau.mil/CommunityBrowser.aspx?id=21805 (accessed April 17, 2009).

[2]Department of Defense, "President's Blue Ribbon Commission on Defense Management, National Security Planning and Budgeting" (aka The Packard Commission Report), 30 June 1986. President's Blue Ribbon Commission on Defense, Formula for Action: A Report to the President on Defense Acquisition. February 28, 1986 (1986): 11. www.ndu.edu/library/pbrc/pbrc.html (accessed April 3, 2009).

[3]Barnett, Thomas P. 2004. *The Pentagon's new map, war and peace in the twenty-first century.* New York: Berkley Books.

[4]Department of Defense, "Department of Defense Instruction, DoD 5000.02, Operation of the Defense Acquisition Process" 8 December 2008, (2008): Part 1: 12, also Enclosure 6: 51–53. http://www.dtic.mil/whs/directives/corres/pdf/500002p.pdf (accessed April 12, 2009).

[5]United States Code, Title 10, Subtitle A, Part IV, Chapter 141, Section 2399. "Operational Test and Evaluation of Defense Programs," Director, Operational Test and Evaluation (DOT&E), specifically: Section 2399: "The Secretary of Defense shall provide that a major defense acquisition program may not proceed beyond low-rate initial production until initial operational test and evaluation of the program is completed." www.law.cornell.edu/uscode/10/usc_sec_10_00002399-000-.html (accessed March 7, 2009).

[6]Ibid., DOT&E Responsibilities.

[7]Gropman, Alan. 1997. *The big 'L': American logistics in World War II.* Washington, D.C.: National Defense University Press.

[8]General Accountability Office. 2008. *Rapid acquisition of the Mine Resistant Ambush Protected Vehicles.* Washington, D.C.: GAO.

[9]Chao, Pierre. 2009. "Center for Strategic and International Studies (CSIS) Study on Defense Industrial Planning." Briefing to the Information Technology Association of America, 26 February 2009, Washington, D.C.

[10]James E. Cartwright, Vice-Chairman Joint Chiefs of Staff, General USMC. Briefing to the Senate Armed Services Committee on Systems Acquisition, 16 June 2009. http://www.armed-services.senate.gov (accessed July 2, 2009).

[11]Adolf, Pete, et al., "Developmental Test and Evaluation Defense Science Board Task Force Study." Department of Defense (2004): 6, 16. https://acc.dau.mil/GetAttachment.aspx?id=229302&pname=file&aid=37075&lang=en (accessed June 6, 2009).

[12]Department of Defense, Joint Defense Capability Study of 2004. aka, "Aldridge Study: Joint Defense Capabilities Final Report" (Joint Defense Capabilities Study January 2004): 2–7. https://acc.dau.mil/CommunityBrowser.aspx?id=21805 (accessed June 3, 2009).

[13]Guay, Terrence R. 2007. *Globalization and its implications for the defense industrial base.* Carlisle Barracks, PA: U.S. Army Strategic Studies Institute.

[14]Director of Operational Test and Evaluation. Deputy Secretary of Defense. 2004. "Department of Defense Testing in a Joint Environment Roadmap, Strategic Planning Guidance. Fiscal Years

[15]Department of Defense. "National Defense Strategy 2008": 17 www.defenselink.mil/news/2007 (accessed June 1, 2009).

2006–2011, Final Report, November 12, 2004". Washington, D.C.: Department of Defense (2004): 8, 12–14. http://www.dote.osd.mil/reports/TestinginaJointEnvironment-Public111204.pdf (accessed June 12, 2009).

[16]Ibid., 8, 18.

[17]Department of Defense. The three studies are: "Defense Acquisition Performance Assessment Summary (DAPA), A Report by the Assessment Panel of the Defense Acquisition Performance Assessment Project, For the Acting Deputy Secretary of Defense" (Defense Acquisition, Performance Assessment, Executive Summary, December, 2005): 5. http://www.defenselink.mil/pubs/pdfs/DAPA%2012-2%20WEB%20Exec%20Summary.pdf (accessed June 14, 2009). Includes "Defense Science Board Task Force Study: Developmental Test and Evaluation" (aka The Pete Adolph Study named after former Deputy Under Secretary of Defense, the Honorable Pete Adolph): and the Department of Defense, "Joint Defense Capability Study of 2004," aka "Aldridge Study: Joint Defense Capabilities Final Report", Joint Defense Capabilities Study January 2004.

[18]Adolf, Pete, et al. "Developmental Test and Evaluation Defense Science Board Task Force Study of 2004" (Defense Science Board 2004): 4–5. https://acc.dau.mil/GetAttachment.aspx?id=229302&pname=file&aid=37075&lang=en (accessed May 7, 2009).

[19]Department of Defense. "National Defense Strategy 2008": Washington, D.C.: DoD (2007): 8, 15–17. http://www.defenselink.mil/pubs/2008nationaldefensestrategy.pdf (accessed June 1, 2009).

[20]Honorable John J. Young, Jr. Under Secretary of Defense (Acquisition, Technology, and Logistics). Statement Before The House Armed Services Committee Subcommittee On Strategic Forces, April 17, 2008. www.dod.mil/dodgc/olc/docs/testyoung080417.pdf (accessed May 20, 2009).

[21]Department of Defense. Office of the Director, Systems and Software Engineering (SSE). "Systems Engineering Guide for Systems of Systems, Version 1.0." (AT&L/DSSE August 2008): 21, 24–25. http://www.acq.osd.mil/sse/docs/SE-Guide-for-SoS.pdf (accessed May 14, 2009).

[22]United States Senate, S-454, Senator Levin and Senator McCain. Senate Bill 454; "The Weapons Systems Acquisition Reform Act of 2009". Specifically, Sec 102, Director, Developmental Test and Evaluation. http://thomas.loc.gov/cgi-bin/query/z?c111:S.454 (accessed June 3, 2009).

Bibliography

Adolf, Pete, et al. *Developmental Test and Evaluation Defense Science Board Task Force Study of 2004*. https://acc.dau.mil/GetAttachment.aspx?id=229302&pname=file&aid=37075&lang=en (accessed April 3, 2009).

Barnett, Thomas P. 2004. *The Pentagon's new map, war and peace in the twenty-first century*. New York: Berkley Books.

Cartwright, James E. (Vice-Chairman Joint Chiefs of Staff). Briefing to the Senate Armed Service Committee on Systems Acquisition, 16 June, 2009. http://armed-services.senate.gov (accessed July 17, 2009).

Chao, Pierre. Center for Strategic and International Studies (CSIS) briefing to the Information Technology Association of America, 26 February 2009, Washington, D.C.

Department of Defense. Defense Acquisition Performance Assessment Summary (DAPA), A Report by the Assessment Panel of the Defense Acquisition Performance Assessment Project, for the Acting Deputy Secretary of Defense. Defense Acquisition, Performance Assessment, Executive Summary, 2005. http://www.defenselink.mil/pubs/pdfs/DAPA%2012-Department of Defense (accessed May 12, 2009).

Department of Defense Instruction, DoD 5000.02, Operation of the Defense Acquisition Process, 2008. http://www.dtic.mil/whs/directives/corres/pdf/500002p.pdf (accessed May 15, 2009).

Department of Defense. Joint Defense Capability Study of 2004. aka "Aldridge Study: Joint Defense Capabilities Final Report," Joint Defense Capabilities Study, 2004. https://acc.dau.mil/CommunityBrowser.aspx?id=21805 (accessed May 12, 2009).

Department of Defense. "National Defense Strategy 2008". Washington DC., 2007. http://www.defenselink.mil/pubs/2008nationaldefensestrategy.pdf (accessed April 6, 2009).

Department of Defense. Office of the Director, Systems and Software Engineering (SSE), Systems and Software Engineering. August 2008. Systems Engineering Guide for Systems of Systems, Version 1.0, 2008. http://www.acq.osd.mil/sse/docs/SE-Guide-for-SoS.pdf (accessed May 16, 2009).

Deputy Secretary of Defense. Department of Defense Testing in a Joint Environment Roadmap, Strategic Planning Guidance. Fiscal Years 2006–2011, Final Report, November 12, 2004. Director of Operational Test and Evaluation, Washington D.C., 2004. http://www.dote.osd.mil/reports/TestinginaJointEnvironment-Public111204.pdf (accessed June 1, 2009).

General Accountability Office. 2008. *Rapid acquisition of the mine resistant ambush protected vehicles*. Washington, D.C.: GAO.

Gropman, Alan 1997. *The big 'L': American logistics in World War II*. Washington, D.C.: National Defense University Press.

Guay, Terrence R. 2007. *Globalization and its implications for the defense industrial base*. Carlisle Barracks, PA: U.S. Army Strategic Studies Institute.

President's Blue Ribbon Commission on Defense Management, National Security Planning and Budgeting (aka The Packard Commission Report), 30 June 1986. President's Blue Ribbon Commission on Defense, Formula for Action: A Report to the President on Defense Acquisition, 1986. www.ndu.edu/library/pbrc/pbrc.html (accessed May 23, 2009).

United States Code, Title 10, Subtitle A, Part IV, Chapter 141, Section 2399. Operational Test and Evaluation of Defense Programs. www.law.cornell.edu/uscode/10/usc_sec_10_00002399-000-.html (accessed May 16, 2009).

United States Senate, S-454, Senator Levin and Senator McCain. Senate Bill 454; The Weapons Systems Acquisition Reform Act of 2009. Specifically, Sec 102, Director, Developmental Test and Evaluation. http://thomas.loc.gov/cgi-bin/query/z?c111:S.454 (accessed May 16, 2009).

Young, John J. Jr., Under Secretary of Defense (Acquisition, Technology, and Logistics). Statement before the House Armed Services Committee Subcommittee on Strategic Forces, April 17, 2008. www.dod.mil/dodgc/olc/docs/testyoung080417.pdf (accessed May 16, 2009).